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point out the individuals). There are plenty of theorists who have tried to teach how sexes could be produced at will, among which consult,

Die willkürliche Hervorbringung des Geschlechts bei Menschen und Haustieren. JANKE. Berlin, 1889. pp. 579.

This work is a synopsis of various theories of sex. About 400 pages are introductory to the main thesis, and about 100 pages are devoted to notes supplementary to the introductory matter, which treats of the history of sex and heredity theories from Aristotle down. Then follows an historical section on fertilization and causes of sterility, sections on menstruation, the how, when and where of fertilization, followed by sections on artificial fertilization, stirpicultural and other social developments connected with the relation of the sexes. Further sections on the origin, regulation and differentiation of sex lead to the main thesis, which is, that the mother's influence is represented by male offspring and the father's by female, and that the more finely nervous organization overcomes the more plethoric and determines the sex. This is almost the identical conclusion advocated by Starkweather in his work on the *Law of Sex*, in which typical couples are taken and the sex of their offspring predicted. The weakness in this work lies in the method of treating the temperament. So many factors are taken into consideration, that the data presented by any family whatever can easily be made to substantiate the theory; but when we try to apply the theory in special cases, we necessarily meet serious difficulties in the many positive and many negative quantities, each of unknown value, to be considered. Fiquet, Hanssen, Lehn-dorf, the Talmud, and others agree with the above mentioned authors in believing that sex alternates, and that the stronger of the two factors prevails in the determination; but Düsing has shown that the facts that favor such views are really the outcome of the general laws of sex with reference to nutritive states. If the tendency to alternation could be proved, it would account in a simple manner for the numerical equality of the sexes. A thorough acquaintance with biological facts gives precedence to the principles enumerated by Düsing, and such alternation would itself ultimately rest upon alternations of the nutritive conditions. A census should be taken of the order of the sexes in births, to ascertain if a tendency to alternation exists. Nearly all the facts adduced by the thousand and one theorists in support of various fantastic views are assimilable with the Düsing principles, as for example, the following: artificial fertilization produces males; female slaves produce an excess of females; the longer the pause between births the greater the number of female births; tropical peoples bear more females (this, too, with a desire for males so strong that female infanticide is practiced); the parent of strongest passion (reflex action of vigorous sexual elements) determines the opposite sex. Criminals (who are of strong nature) beget daughters in excess; second marriages produce boys in excess, etc. Some thinkers, like Retzius, affirm sex of the different organs of the body, the endoderm being female, the ectoderm male. Others, like Heincke, go further, and affirm that the right side of the body is male and the left female, so that the union of spermatozoa from the right testicle with ova from the right ovary produces males. Stockton-Hough (*The Laws of the Transmission of Resemblance from Parents to Children*, N. Y. Medical Record, August, 1873) believes in an alternation of the sexes due to the effect of the preceding child in its influence upon the development of the subsequent child. Other authors have held an alternate action of the two sides of the body; but cases of ovariectomy have failed to substantiate their views. Millot and Roth believe that sex is determined by the relative positions of husband and

wife during sleep; the magnetism of the right side of the male, acting on the left side of the female, produces females. But the number of ridiculous theories is nearly endless, and we stop here. Connected with these theories are formulæ for making the children resemble either parent. These have been stated in a most complex manner by Girou, but are too lengthy for presentation. The gist of them lies in his view that the internal organization is most often transmitted to the same sex, the external to the opposite, and heredity plays a great rôle; if a father resembles his mother, his daughter will resemble him, etc. This subject, like the rest, has received a good deal of attention from theorists, but the entire matter is confused and contradictory, both with facts and with itself in any one author, and becomes chaotic when different writers are compared. This part of the subject awaits scientific investigation.

On the physiology of menstruation, consult, besides Janke,

Physiologie der Zeugung. GRÜNHAGEN. Leipzig, 1883.

This author presents in a condensed form what is known through various investigations upon the subject of ovo- and spermatogenesis, menstruation, methods of reproduction, etc., etc. Concerning the simpler phenomena of ovogenesis, there is considerable agreement, but hundreds of investigations have been directed toward the solution of certain problems connected with spermatogenesis. We may roughly recognize the following schools: (1) Those who, like Biondi, believe that only one sort of cells exists in the testicular epithelial layer, and that the large cells near the wall of the follicle bud off nuclear bodies, each of which, by karyokinetic division, finally produces a group of cells from which the spermatozoa arise by direct metamorphosis. These cells or *spermatoblasts* are arranged in a column whose base embraces the perennial mother-cell. (2) Those who think the basal cell is the female part of the original germ-cell, and will be thrown off. (3) Those who think the basal cell is a distinct kind of cell with which the spermatozoa produced outside it have secondarily conjugated for nutritive purposes. (4) Those who believe these cells are only supporting elements, furnishing a sort of spongy net within the meshes of which the spermatozoa are held until discharged. It is the first two schools whose difference is of radical interest, though it may be mentioned that Balbiani thinks the "yolk nucleus" sometimes seen in eggs represents an epithelial (male) cell from the mother which has fertilized the egg, and that a similar fertilization of female protoplasm from the father takes place in spermatogenesis. But we pass on to the main subject, and refer mainly to Tillier's work.¹ In animals there are definite seasons when the reproductive activities are at their height, the physiological state being known as "heat" or "rut." This period has been established in connection with nutrition and climatic conditions favorable to the rearing of the young. These periods usually occur at the same time in the two sexes. Both undergo the profoundest physiological and psychological changes, everything seeming to subserve reproduction. (On many of these points, cf. Darwin). When we turn to man, do we find anything comparable? At the period of puberty, the human youth of both sexes develop special characters that have a reproductive significance, but these characteristics are practically permanent. In the female, however, there is a monthly rhythm supposed to be comparable to that in animals. The medical dictum now is that menstruation is ovulation, or marks the successive completions of maturations of ova and the bursting of a Graafian follicle, setting free the ovum. The ovum is received by the Fallopian tubes and carried to the uterus by the action of cilia. Meanwhile the spermatozoa, if present, swim actively against the ciliary

¹For title see below.